19. (Amended) The method according to claim 18, wherein said semiconductor process is one of a chemical vapor deposition process and a physical vapor deposition process.

REMARKS

Claims 1-23 are pending in the above-referenced application. Applicants wish to thank the Examiner for her telephonic communications on 28 January 2003 providing constructive suggestions as to the structural limitations regarding Fig. 2(c) and the vertical wall of the outer part, which is further defined by way of the instant amendment. The claims are amended to distinguish over the prior art according to the specification and the drawings without introducing new matter.

The Examiner's attention is directed to the claims as amended so as to recite important features of the vertical wall structure of the present invention neither taught nor suggested by the prior art. As compared to the present invention, the cited references teach away from the purpose of the present invention. Although disposed in a crowded art, Applicants provide an unsuggested and unappreciated advantage. The gas-feeding pipe of Shimahara's invention will induce the peeling particles and the plural upward openings of the pipe will be jammed by the peeling particles of the solid products. The present invention discloses a novel gas-feeding pipe, which has not been suggested by the prior reference. It is thus believed that the claims of the present invention are patentable. The Applicant would like to show that the present invention and the cited reference are respectively applied in the following different ways.

Rejections under 35 U.S.C. 102 and 35 U.S.C. 103

The examiner considers that the Shimahara invention and the present invention both disclose a gas-feeding pipe comprising one or plural openings in the direction toward the outer part. According to the Final Office Action, the Examiner mentions that Figure 1 of Shimahara shows that the outer part (1A), a u-shaped structure, extends around the sides and the top of the inner part (2a) and a gas-feeding tube (1C, between the inner and outer parts) with an opening (1c) facing the top portion of the outer part. Therefore, any gas flowing from the opening in the gas-feeding tube in an upward direction will indeed be flowing in the direction of the outer part. In fact, the present invention emphasizes that one or plural

openings are disposed merely toward the vertical wall of the outer part for preventing the film of solid products from peeling and forming particles to jam the opening of the gas-feeding pipe (please refer to the amended claims 1, 12, 18 and Fig. 2 (c) of the present invention, which recites that the cooler inletting gas will be introduced to the outer part nearby the heater, and contact with the inner part will occur after the gas is homogeneously heated). However, the Shimahara invention (Figs. 1-2 and Figs. 5-11) discloses plural openings toward the top cover of the outer tube, wherein the cool inletting gas of plural openings will be introduced, having contact with the hot inner part directly without being homogeneously heated; thereby the film of the inner part will easily cause the peeling of particles due to heat effects. Furthermore, the exhaust will carry the peeling particles from the inner part to the outer part, thereby the peeling particles going down due to gravity, and the openings toward the top being jammed.

Chemical Vapor Deposition (CVD) process is a typical method for forming a film on a wafer. CVD employs chemical reactions by reacting gaseous reactants in the chamber to form solid products. However, the CVD process not only deposits a film of solid products on the wafer, but also deposits a film of solid products on the interior wall of the inner tube and a part of the outer tube. There is a great temperature difference between the inletting gas and the inner part. Presently, substantial heat stress occurs at the film of solid products on the interior wall of the inner part and the outer tube. The thin film of solid products on the interior wall of the inner part peels off due to heat effects and forms particles to contaminate the wafer. Furthermore, the exhaust carries the peeling particles from the inner part to the outer part, and then the upward openings like that of Shimahara's invention will be jammed by the sinking peeling particles. The inletting gas is introduced to the outer part nearby the heater via the plural openings and there will be enough time for the cool inletting gas to be heated before contact with the hot inner part. Hence, there should not be a great temperature difference or a great heat stress between the inletting gas and the inner part, and the particles adhered to the inner part will not peel off due to the low temperature difference between the inletting gas and the inner part of the present invention.

The Shimahara patent teaches several kinds of gas-feeding pipes (Figs. 2, 5-11 of Shimahara's Patent) all different from that of the present invention. All of the gas feeding pipes of the cited reference include an upward opening toward the top cover of the outer tube.

Unlike the gas-feeding pipe of the present invention, those of the cited reference will introduce an inletting gas upward having contact with the inner part directly, but there will not be enough time for the inletting gas to be heated. Hence, there should be a great temperature difference and a great heat stress between the inletting gas and the inner part. As a result, the thin film of solid products on the interior wall of the inner part will peel off due to the heat effects and will form particles to contaminate the wafer. Furthermore, the upward openings will be jammed by the peeling particles of the solid products.

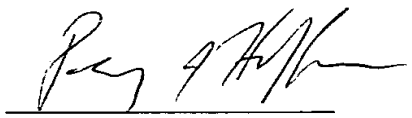
Further comparing Fig. 10 of the cited reference with Fig. 2 (c) of the present invention; it will be easier to distinguish two inventions. In Fig. 2 (c), the present invention discloses a gas-feeding device having plural gradient openings toward the vertical wall of the outer part for controlling an inletting gas to flow stably toward the outer part having the heater thereby there being enough time to heat the inletting gas and make the temperature of the inletting gas approach that of the gas in the inner part. When the CVD reactor is operated in a continuous state, the inletting gas flows toward the vertical wall of the outer part via the plural gradient openings and is heated by the heater of the outer part. According to the present invention, the cooler inletting gas will not have contact with the hotter inner part before being homogeneously heated and there should not be a great temperature difference or a great heat stress between the cooler inletting gas and the inner part. Hence, the particles adhered to the inner part will not peel off due to the low temperature difference between the inletting gas and the inner part.

However, Fig. 10 of the cited reference discloses a gas-feeding device having plural gradient openings toward the top cover of the outer part. Shimahara states that an occurrence of convection of the inletting gas in the space between the inner tube and the outer tube can be restrained while the gas-feeding pipes of the cited reference are used and the airflow in the space between the inner tube and the outer tube is stable. In fact, Shimahara discloses a batch reactor for a batch reaction. A batch reactor cannot be operated in the way that a continuous reactor can be. As discussed on pages 9 and 10 of Applicant's specification, the apparatus always has to keep the chamber from contaminated gas and remove the gas from the outlet. The cool inletting gas of the cited reference flows upward via the plural upward openings. The gas extracted from the outlet influences the airflow of the inletting gas and the cool inletting gas is introduced, having contact with the hot inner part without homogeneous

heating. The gas is thus not warmed homogeneously, as presently claimed. Therefore, the temperature difference between the cool inletting gas and the hot inner part is great, and it is easy to cause the film of solid products to peel and form particles to contaminate the wafers. Moreover, extracting the gas from the gas-out outlet will induce the peeling particles to jam the upward opening of the gas-feeding pipe. In contrast, the present invention can reduce the contamination sources and will not cause the undesirable reaction of the cited invention. The gas-feeding pipe of the present invention includes plural vertical openings for introducing a cool feeding gas flowing toward the outer part nearby a heater in order to provide the feeding gas with enough time for heating, so as to diminish the heat stress and prevent particles adhered to the inner part from peeling off. There will be enough time to heat the inletting gas and make the temperature of the inletting gas approach that of the gas in the inner part. Therefore, the particles adhered to the inner part will not peel off due to the low temperature difference between the inletting gas and the inner part.

Accordingly, the present invention discloses a novel structure different from that of the cited reference. Moreover, the cited reference cannot be applied in the same way as the present invention. It is clear that the cited reference fails to disclose or teach the apparatus as recited in claims 1-23 of the present invention under 35 U.S.C. 102 and 35 U.S.C. 103.

Respectfully submitted,



Perry J. Hoffman
Reg. No. 37,150

Docket No.: 201056-0052
Michael Best & Friedrich LLC
401 N. Michigan Ave., Suite 1900
Chicago, IL 60611
(312) 222-0800

VERSION MARKED TO SHOW CHANGES

1. (Amended) An apparatus for forming a film on a wafer in a semiconductor process comprising:

an inner part for mounting therein said wafer;

an outer part covering said inner part wherein a gas inlet and a gas outlet are formed between said inner part and said outer part; and

a gas-feeding pipe partially mounted inside said gas inlet for adjusting a feeding gas flowing therein in the direction toward a vertical wall of said outer part instead of said inner part to prevent particles adhered to said inner part from peeling off, whereby said feeding gas is warmed homogeneously before reaching said inner part.

12. (Amended) A gas-feeding device for feeding a gas into a film-forming apparatus having an inner part and an outer part to form a film on a wafer mounted in said inner part, the temperature difference between said gas and said inner part being ranged from 300° C to 850° C, comprising:

a gas-feeding pipe partially mounted between said inner part and said outer part for adjusting said gas flowing therein in the direction toward a vertical wall of said outer part to prevent particles adhered to said inner part from peeling off; and

a flow controller connected to said gas-feeding pipe for controlling a flow rate of said gas.

18. (Amended) A method for feeding a gas into a film-forming apparatus having an inner part and an outer part to form a film on a wafer mounted in said inner part in a semiconductor process, comprising steps of:

(a) feeding said gas into a space between said outer part and said inner part and directing a flow of said gas in the direction toward a vertical wall of said outer part to prevent particles adhered to said inner part from peeling off; and

(b) leading said gas into said inner part along a path between said outer part and said inner part so that gas warms before reaching said inner part.

19. (Amended) The method according to claim 18, wherein said semiconductor

process is one of a chemical vapor deposition process ~~or~~ and a physical vapor deposition process.

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